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MONEY AND PRICES. I

A STATISTICAL STUDY OF PRICE MOVEMENTS

I. INTRODUCTION AND DISCUSSION OF METHOD

The recent literature on monetary theory is, to a great extent, concerned with a controversy as keen as any ever waged—the controversy over the Quantity Theory of Money. The discussion is carried on in rather better spirit than was shown in some of the earlier controversies, but the differences are just as marked and the defenders of each side just as earnest. Some slight concessions have been made by each side. There have been some shiftings from untenable positions and much careful qualification in statement, but, in general, the result today seems to be a clear deadlock, each side refusing to give up its main contentions.

Such a situation suggests that the line for future advance lies in a careful scrutiny of the facts of the case rather than in further theoretical analysis. The problem considered in this study is the relationship which exists between changes in the amount of money (in banks or in circulation), or changes in the amount of bank deposits on the one hand, and changes in general prices and changes in the prices of particular groups of commodities on the other hand. The study is primarily statistical—a study of what has actually happened. However, the bearing of the results upon certain theoretical points of monetary discussion is briefly indicated.

Prices are often grouped for the study of price changes into classes,[1] such as: wholesale prices, retail prices, prices of stocks, of bonds, of real estate, prices fixed by law, prices fixed by custom, wages, prices of commodities made of the money metal, prices for substitutes for such commodities, speculative prices, and rents. For many of these no index numbers are available; e.g., retail prices (except for food), real estate prices, prices fixed by law and custom, prices of commodities made of the money metal, of substitutes for them, and rents. In some cases, where material could be found, new index numbers were constructed for this study. On the other side of the comparison—the money side—we have estimates of the total and per capita circulation of money in the United States and statistics of the amount of specie and legal tenders and of deposits in the clearing-house banks of New York and Chicago. When the term money is used in this study in a general sense, it may mean any or all of these.

It is clearly recognized that the list of price movements and of money movements given is not ideal, but availability and not theoretical perfection must be the determining factor. The discussion is limited to the United States.

The results obtained are stated merely as facts concerning the particular markets studied by certain methods for definite periods. No attempt is made to generalize the particular statements into laws holding for all times and all places. Such an attempt would require an estimate of the error which is involved in the process and also an estimate of the error involved in generalizing from a certain limited period. This last estimate especially would be very difficult, if not impossible, to get.[2]

In economics we cannot experiment, and so we must rely on observation and comparison. We have price changes recorded in series of index numbers. The question then is whether any relationship exists between the price movements indicated by these series of index numbers and variations in the amount of money in

[1] Cf. Johnson, *Money and Currency*, p. 127; Fisher, *The Purchasing Power of Money*, pp. 186–87.

[2] Cf. Edgeworth, "On the Use of the Theory of Probabilities in Statistics Relating to Society," *Journal of the Royal Statistical Society*, LXXVI (January, 1913), 186–87.

circulation or in banks during the same period. Taking causation in Karl Pearson's sense of "an antecedent stage in a routine of perceptions,"[1] we evidently must find out whether changes in one series are followed by corresponding changes in the other series and get some method for summarizing, in simple form, the result of our observation.

Pearson's Coefficient of Correlation has been used at times for this purpose.[2] But the applicability of the method of correlation to cases involving index numbers has been questioned.[3] The objections to the use of the Coefficient of Correlation with index numbers are (1) that it entirely disregards the element of time, and (2) that it shows perfect correlation when the absolute changes are the same as well as when the relative changes are the same. When we are dealing with index numbers we are, of course, concerned with relative, not absolute, changes.

The present writer has proposed[3] a means of expressing the relationship between two series, called the Degree of Correspondence. There are two cases: (1) where account is taken of the direction of the change only, and (2) where the amount of the change as well as its direction is considered. To compute the Degree of Correspondence in the first form, we start with the definition of correspondence between successive terms of the two series. If an increase or decrease of one series occurs with a movement in the same direction of the other series, or if both remain constant, we say there is positive correspondence and express it by $+1$. If one series shows no change between two terms while the other changes, there is no correspondence, which is denoted by 0. If one series increases and the other decreases, or vice versa, there is negative correspondence, indicated by -1. The numerical value for the first form of the Degree of Correspondence is found by taking the arithmetic mean of the numbers which indicate the correspondence

[1] *Grammar of Science*, p. 150.

[2] Cf. Yule, "The Application of the Method of Correlation to Social and Economic Statistics," *Journal of the Royal Statistical Society*, LXXII (December, 1909), 721. Yule gives a list of the more important cases of its use and some discussion of the results obtained.

[3] Magee, "The Degree of Correspondence between Two Series of Index Numbers," *Quarterly Publications of the American Statistical Association*, XIII (June, 1912), 174.

between the successive terms of the two series. It is obvious that this result may vary in value from +1 to −1.

Nothing particularly new is introduced in this method. The only novelty is to be found in the method of expressing the result. For example, Irving Fisher,[1] to disprove the theory that the rate of interest depends upon the amount of money in circulation, shows that the per capita circulation of money and the rate of interest, in the period 1871–1905, vary together in 18½ cases and in opposite directions in 15½ cases. If interest did depend on the amount of money, we should expect to find that almost all of the cases showed variations in opposite directions. Fisher counts the cases where one factor is constant and the other varies, as neutral, and adds ½ to the number of direct variations and ½ to the number of inverse variations. King[2] has an empirical method for getting an expression for what he calls the Coefficient of Correlation (not, of course, the Pearsonian) by a formula which considers the relation of the number of pairs of items in the two series to the number of "concurrent deviations" that is, deviations in the same direction.

The basis for the use of this method of observing whether the changes of two series of quantities agree or not is the same, whatever means are used to express the result, and may be given briefly as follows: If we consider the direction of the changes shown by two series of numbers entirely unrelated, and if the number of items in the two series is large enough to allow the Law of Averages to work, we should expect the number of agreements and disagreements to be about equal. If, in the long run, the agreements and disagreements are not equal, then we argue that there is some causal relation between the two series. Bowley[3] has developed this idea in an analogous case. Illustrations of this principle are common. To take the classic example of dice throwing, if we are throwing a single die a large number of times, we expect to have each of the faces come up about the same number of times. If then, in the long run, one particular face comes up more frequently than the others, we conclude that the turning-up of the faces is not a matter

[1] *The Rate of Interest*, pp. 320–22.

[2] *Elements of Statistical Method*, p. 208.

[3] *Elements of Statistics* (3d ed., London: 1907), p. 268.

of chance, but that there is a specific relation of cause and effect. Probably the die is loaded. Or suppose we are studying the effect of changes in temperature upon the sale of some commodity. If no causal relationship exists, we should expect to find associated with increases or decreases in temperature, in the long run, practically equal numbers of cases of increases and decreases of sales. But if, in the long run, an increase in temperature is found in most instances to be accompanied by an increase in sales, and a decrease in temperature by a decrease in sales, we should argue that some causal relationship existed between the two.

The first form of the Degree of Correspondence, as was pointed out, has virtually been used by others, but in the second form something new is added. For that form takes into account not only the direction of the change, as do the other methods similar to the Degree of Correspondence, but also the amount of the change. Unless the changes are in exactly the same proportion, we substitute for the 1 of the $+1$ or -1 of the first method, a fraction which is obtained as follows: the percentages of increase or decrease for the corresponding items are computed, and the smaller is divided by the larger. After this number has been computed for each pair of values, the arithmetic mean is taken and the result gives the Degree of Correspondence in the form which considers the amount as well as the direction of the changes. In most instances we shall use only the first form of the Degree of Correspondence. In a few cases where correspondence in more than direction might be expected, the second form will be employed.

In a study of price changes and changes in the amounts of money, we are dealing with the results of a vast number of co-operating causes. It would be idle to expect that changes in prices could be the sole cause of changes in the amounts of money or that changes in the amounts of money could be the sole cause of changes in prices. So we use the broader term "causal influence" rather than the single word "cause." We are interested, then, in testing the amount of causal influence between the movement of prices and the movement of the volume of money, and in the question of the direction in which the causal influence runs.

Some time often elapses between the cause and the effect. In

such a case we have an element of what is called "lag." It is this element of lag which enables us to trace more causal influence from the facts displayed in one series to those displayed by the other than in the reverse direction. Suppose that we are dealing with two series expressed in weekly averages. We are interested in the movements of the series—whether the terms of the series are increasing or decreasing. We may designate as the movement for any given week, the change from the preceding week. Thus if the term of the series for the first week in January were higher than that for the last week of December, we should express it by saying that the first week in January showed an upward movement. With this convention as to terminology, we may now show the importance of lag in the study of causal influence. If a week elapses between the cause and the apparent effect, then obviously the correspondence in the movement of the one series (the cause) with the movement of the other is not with the movement for the same week, but with the movement for the following week. Thus under the conditions assumed, the movement in the *effect* series for the second week in January would correspond to the movement in the *cause* series for the first week in January. The movement in the *effect* series for the third week in January would correspond to the movement in the *cause* series for the second week in January, and so on. Thus if we know that one series lags after the other, we assign the causal influence to the second series. Of course, we shall not expect to find cases where complete correspondence is shown when lag is allowed for and no correspondence is shown when lag is not allowed for. But we do expect to find cases where more correspondence is shown when lag is allowed for than when it is not. One reason for the lack of complete correspondence is the different lengths of time which may elapse between the cause and the effect. If the two series move together, both series may be the results of one cause, or the interval that separates cause and effect may be less than the unit of time covered by our figures. For example, if a day elapses between the cause and the effect, weekly figures would probably not show any lag.

In arguing for the existence of more causal influence because there is more correspondence when lag is allowed for in one direc-

tion than when it is allowed for in the other, we must remember certain limitations of the method. If we have two series moving all in the same direction, e.g., $\begin{Bmatrix} 20, & 25, & 30, & 35, & 40, & 45 \\ 17, & 19, & 23, & 30, & 36, & 40 \end{Bmatrix}$, then the correspondence (for direction) is perfect, whether we compare with the items of one series the same, previous, or later items of the other series. So the method gives us results only when the series do not move in the same direction all of the time. And any long-continued movement in one direction lessens the possibility of telling in which direction the causal relation lies.

Then again we must consider the matter of periodicity. The two series may display some regularity of movement. If we take the two series $\begin{Bmatrix} 20, & 25, & 21, & 27, & 23 \\ 13, & 17, & 15, & 18, & 12 \end{Bmatrix}$, we see that the terms alternately increase and decrease. The series then shows perfect positive correspondence (for direction) for the same items. If we shift one item forward or one item backward, then the comparison shows perfect negative correspondence. If we shift two items forward or two items backward, we get perfect positive correspondence again. We shall, in general, shift only a few items in each direction in order to avoid getting to the point where the periodicity of the series would explain the movement rather than any correspondence between the two series due to an element of lag.

Two distinct kinds of information can be derived from the study of the correspondence of two series, if tests for lag are made in both directions: (1) we may get information as to the amounts and kind (whether positive or negative) of correspondence, and (2) by comparing the amounts of correspondence for the various amounts of lag, we may determine the direction in which the greater causal influence runs, remembering that the cause precedes the effect. An illustration may be given. Suppose we are testing two series, A and B, composed of weekly figures, and we find that the correspondence of the movement of A with the movement of B

for the previous week is $+.20$
for the same week is $+.16$
for the following week is $+.10$.

We then say that B exerts more causal influence on A than A exerts on B, for the correspondence is greatest between A and the previous week of B. That is, the change in B precedes the change

in A. If, however, the correspondence of the movement of A with the movement of B

for the previous week is +.15
for the same week is +.13
for the following week is +.30,

then we argue that A exerts more causal influence on B than B exerts on A, for the greatest correspondence of movement comes in B a week following the movement in A.

In most cases where lag has been studied it has been tested in only one direction, because it is assumed that the causal influence runs in a certain direction. In this paper we shall test for lag in both directions, making no assumptions as to the direction in which the causal influence runs.

One form of study of statistical movements attempts to separate the movement into various parts for study. Thus Norton[1] analyzes movements in statistics as resolvable into certain ideal elements, namely, (1) the growth element, (2) periodic elements, and (3) dynamic elements: (*a*) the cycle, (*b*) the catastrophe, and (*c*) minor dynamical changes. We are not interested in following this analysis completely, but by taking long periods we get at least complete credit cycles, and by taking averages of various lengths of time we eliminate the matter of minor periodicity, e.g., the average for the year eliminates any periodicity which occurs within the year. We are primarily interested in testing the relationship between price movements and the money movements just as they occur no matter from what cause they may arise.

Having outlined the method to be used in our study, we may next indicate the material to be studied. The list of price movements studied is as follows:

Bond prices on the New York Stock Exchange, 1890–1908, weekly, monthly, and yearly, from a table of index numbers prepared for this paper.

Mitchell's Index Numbers of Stock Prices on the New York Stock Exchange, 1890–1909, monthly and yearly.

The Commons and Stone Table of Stock Prices on the New York Stock Exchange, 1879–1901, yearly.

Farm products' prices in Chicago 1899–1908, monthly, from index numbers prepared for this paper from data given in the Bulletins of the Bureau of Labor.

[1] *Statistical Studies in the New York Money Market*, p. 23.

Speculative prices on the Chicago Board of Trade, 1899–1908, weekly and monthly, from an index number prepared for this paper.

The Bureau of Labor's Index Numbers of Wholesale Prices, 1900–1911, monthly, and 1890–1911, yearly.

The Aldrich Report's Index Numbers of Wholesale Prices, 1867–1890, yearly.

With these various price movements are compared the appropriate ones of the following: the movement of specie and legal tenders and net deposits of the New York Clearing House banks, weekly, monthly, and yearly; the movement of specie and legal tenders and gross deposits in the Chicago Clearing House banks, weekly and monthly; the total amount of money in circulation in the United States, monthly and yearly; and the per capita circulation of money in the United States, yearly. In addition, the statistical proofs of the Quantity Theory of Money, as given by Kemmerer and Fisher, are tested by the method of the Degree of Correspondence.

In each case a table is constructed showing for the comparisons at the various intervals the number of instances of positive, negative, and zero correspondence, in three columns headed +, −, and o. Then in a fourth column is given the numerical value of the Degree of Correspondence. Those who prefer may, of course, use some other method for summarizing the results so given.

We shall now indicate briefly the bearing of these statistical studies upon present monetary discussion. First, it may be well to indicate clearly what the study does not pretend to do. No attempt is made to offer any complete explanation of price changes. The problem is a narrower one than that problem. The study merely tests the relationship which exists between certain price changes and certain changes in amounts of money. Then the question arises of how this narrower problem is related to the discussion over the validity of the Quantity Theory of Money, which is the principal point of difference in the discussions of monetary theory at the present time.

Probably some, at least, of the difference of opinion between the upholders of the Quantity Theory of Money and their opponents is due to differences in value theory. Both sides agree that a

steady increase in the supply of gold will raise prices. They disagree in their explanations of how the rise in prices will come about, and still more they disagree as to the amount of the change. The upholders of the Quantity Theory insist that "other things being equal," the changes in the two variables tend to be exactly proportional. Since both agree as to the long-run direction of the change, the argument is primarily on the question of the proportionality of the change. The ambiguity in the use of the word "tends," which has been often noticed, is seen here. Tendency may mean what will happen if other things do not interfere—a hypothetical statement; or, tendency may mean what will probably happen under existing circumstances. Tendencies in this sense are discovered by observation of actual occurrences. Perhaps the opponents of the Quantity Theory of Money are talking about what actually happens and the adherents merely about a hypothetical state of affairs. Our problem then may be stated in alternative ways; we are attempting to find out how far the alleged proportionality does occur; or, we are attempting to find out to what extent "other things" are not "equal" in actual experience.

There are three classes of investigations. First, a study is made of the correspondence of certain particular price movements in given markets with the movement of money or deposits in banks or money in circulation. It is obvious that such investigations are not directly a test of the Quantity Theory of Money, for that theory is concerned with the general price level. But according to the Quantity Theory of Money the changes in the quantity of money affect the prices of various forms of wealth in different degrees. Prices do not move in unison: they vary in their adjustability. Irving Fisher[1] gives a list of the various forms of wealth in the order of their adjustability to price changes. Stocks in his opinion, are the most adjustable; wholesale prices are next, and bonds are the least adjustable. J. F. Johnson,[2] however, maintains that increases in the volume of money affect first the prices of stocks and bonds, then speculative prices, and then wholesale prices. If this be true, then the correspondence of the movement of these

[1] *The Purchasing Power of Money*, pp. 186–87.

[2] *Money and Currency*, p. 127.

prices with the movement of the amount of money should be close. Our investigation will determine how close it actually is, in the period studied.

In the comparison of price movements with the movement of bank deposits, some light is thrown on the much-disputed question of whether money gets into banks causing deposits to increase and so causing prices to rise, or whether prices rise first and then deposits increase in order to transact the increased business. No attempt has been made to allow for changes in the volume of transactions. In so far as there are differences in volume it may be assumed that, in general, for the short periods we are considering, increased volume of transactions goes with rising prices, and vice versa, and so the changes in volume merely accentuate the price changes.

The second type of investigation concerns the relation of movements in the amount of money to the movements of wholesale prices. This study may be called an investigation of the crude Quantity Theory of Money—crude because it neglects the factors of rapidity of circulation of money, the amount of bank deposits and their rapidity of circulation, and the volume of trade. To those who hold the Quantity Theory of Money in more refined forms, any lack of correspondence shown will simply measure the extent to which the "other things" were not equal. We may say that the result of such an investigation is a summing-up of the actual relation between the quantity of money and prices for certain periods. It has a bearing on the practicability of Irving Fisher's proposal to stabilize the dollar.[1]

The point which has been mentioned concerning bank deposits may be generalized and applied to money as well, in the cases of both particular and general prices. The question may be put in this form: Do changes in the supply of money cause changes in prices, or do changes in prices cause changes in the supply of money? Irving Fisher's answer is given as follows:

> In a similar way seasonal variations in the price level are reduced by the alternate expansion and contraction of an elastic bank currency. In this case

[1] "A Compensated Dollar," *Quarterly Journal of Economics*, XXVII (February, 1913), 213.

temporarily, and to an extent limited by the amount of legal tender currency, money or deposits or both may be said to adapt themselves to the amount of trade. . . . .[1]

The price level is normally the one absolutely passive element in the equation of exchange. It is controlled solely by the other elements and the causes antecedent to them, but exerts no control over them.[2]

Fisher thus holds that temporarily the amount of money and deposits may be influenced by prices, but that normally the amount of money and bank deposits determines the prices (other things being equal).

The following gives Laughlin's view:

The quantity of media of exchange is a result, not a cause, of the evaluation between gold and goods, and therefore cannot have been the means of fixing prices.[3]

This reasoning holds presumably both for short periods and for long periods. The opposition of these two views is not exact since Laughlin is considering only the money which acts as media of exchange and not that which acts as the standard of value. He does not deny that changes in the quantity of the standard money metal affect its value.

As has been pointed out, we are able to reach some conclusion concerning this problem of the direction in which the causal influence runs by computing the Degree of Correspondence for various amounts of lag. The case is simple if the comparison of a given price movement with the movement of money for a preceding or following week, month, or year shows the highest degree of correspondence. But where the greatest Degree of Correspondence is found in the comparison of the given price movement with the money movement for the same week, month, or year, the case is not so simple. In order to get, in such a case, the clue to the direction in which the causal influence runs, we are forced to consider whether the greater correspondence is shown when the comparison is made with the previous or with the subsequent money movements.

[1] *The Purchasing Power of Money*, p. 161.

[2] *Ibid.*, p. 172.

[3] *Principles of Money*, p. 362.

The Degree of Correspondence has been computed only for the direction of the change in most of the cases. The resulting figures are larger than the figures would be for both direction and amount of the change, since this method uses +1 or −1 in the place of some fraction expressing the relative amounts of change. Some idea of the difference may be had from the cases where the Degree of Correspondence was computed for the direction of the change and then for the direction and the amount of the change, as was done in testing the statistical proofs of the Quantity Theory of Money presented by Kemmerer and Fisher. In the case of Kemmerer's proof the Degree of Correspondence for direction of change is +.48 and for direction and amount of change is +.20. In the case of Fisher's proof, the Degree of Correspondence for the direction of the change is +.31, for the direction and the amount of the change, the figure is +.23.

The third type of investigation examines certain attempts at statistical proofs of the Quantity Theory of Money. These proofs make allowances for the factors omitted from what we have called the crude theory. They compute from statistical determinations of the various factors what the price level should be and then compare it with the price level as given by index numbers. The Degree of Correspondence between the computed and the actual is found to test the conclusiveness of the proof.

II. MONEY AND BOND PRICES

The movement of bond prices on the New York Stock Exchange for the period from 1890 to 1908 inclusive is the first price movement to be studied. Weekly, monthly, and yearly averages are used. To make possible this study a new index number of bond prices was constructed. The index number was computed from the actual prices of certain of the bonds given by Kemmerer in his *Seasonal Variations in the Relative Demand for Money in the United States*, one of the publications of the National Monetary Commission.[1] Kemmerer gives the prices of twenty-seven different bonds

[1] Kemmerer, *Seasonal Variations in the Relative Demand for Money in the United States*, pp. 423–510.

for various periods. From this list were taken nine bonds whose prices are given for the period 1890–1908:

Central Railroad of New Jersey, general gold fives of 1987
Chicago, Burlington and Quincy (Nebraska Extension) fours of 1927
Chicago, Milwaukee and St. Paul, general gold fours of 1989
Denver and Rio Grande, first consolidated gold fours of 1936
Iowa Central, first gold fives of 1938
Missouri Pacific, first consolidated gold sixes of 1920
New York Central and Hudson River (West Shore) first fours guaranteed of 2361
St. Louis and San Francisco, general gold fives of 1931
Wabash, first gold fives of 1939

and the one bond for which prices are given for the period 1891–1908, namely,

Missouri, Kansas and Texas first gold fours of 1990.

The quotations for the prices were taken by Kemmerer from the *Commercial and Financial Chronicle* and are the prices on Friday of each week. As Kemmerer is interested in the problem of seasonal variations, he takes for each year only 52 quotations, even in the years which contain 53 Fridays. So it was necessary in such cases to supply the missing figures from the *Commercial and Financial Chronicle*. In all cases the prices represent "and interest" prices, that is, accumulated interest is deducted. The average weekly price for the years 1890 to 1899 was taken as 100 and the index numbers for each week computed from this as a base. Then the arithmetic mean of the ten sets of index numbers was computed for each week; (for the first year the nine sets of index numbers were averaged). The year is started in each case with the week ending January 4 to 10, since a week ending in January 1, 2, or 3 really has a majority of its days in the preceding year. The result of the calculation is given in Table I.

From this table of weekly index numbers of bond prices was prepared one of monthly index numbers of bond prices. The arithmetic average of the index numbers of the four or five weeks which lie wholly or in a majority of their days within the month was taken as the index number for the month. The result of the calculation is given in Table II.

The yearly index numbers of bond prices were obtained by taking the arithmetic mean of the 52 or 53 index numbers for the weeks which constitute the year. They are given in Table III.

With the movement of bond prices as shown by the weekly index numbers we shall first compare the amounts of specie and legal

TABLE I

INDEX NUMBERS OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, WEEKLY, 1890–1908. THE YEAR BEGINS WITH THE WEEK ENDING—

(Average 1890–1899 = 100)

Week	Jan. 4 1890	Jan. 10 1891	Jan. 9 1892	Jan. 7 1893	Jan. 6 1894	Jan. 5 1895	Jan. 4 1896	Jan. 9 1897	Jan. 8 1898	Jan. 7 1899
1....	99.3	95.8	97.6	98.0	93.0	96.8	98.4	99.5	104.7	111.7
2....	99.5	96.1	97.7	98.1	92.4	96.5	98.1	100.1	105.2	112.2
3....	99.6	95.8	97.8	99.3	91.9	96.6	99.2	100.6	105.1	112.9
4....	99.7	96.2	98.0	99.3	93.3	96.1	98.9	100.8	105.9	113.3
5....	99.7	96.5	98.6	99.7	93.3	94.9	99.3	100.7	106.6	113.0
6....	99.5	96.0	98.3	100.0	93.8	95.1	99.7	100.3	106.5	113.1
7....	99.5	96.2	98.5	99.7	92.7	94.8	100.8	100.2	106.7	113.1
8....	99.4	95.7	98.7	99.1	93.0	94.8	101.0	99.8	104.6	113.2
9....	99.3	95.4	98.0	99.5	93.2	94.4	100.9	100.1	105.1	112.5
10....	99.4	95.8	98.2	98.6	93.6	94.4	100.3	98.8	103.3	113.2
11....	99.6	95.3	97.9	98.6	94.1	93.9	99.8	99.1	103.0	113.3
12....	99.6	95.1	98.2	98.8	94.9	95.6	99.6	98.3	102.0	113.3
13....	99.6	95.2	98.1	98.4	96.2	95.3	99.0	97.3	102.2	113.6
14....	99.2	95.0	98.4	99.0	97.2	95.4	99.6	96.8	102.4	113.3
15....	99.5	95.3	98.5	98.9	97.2	95.4	99.4	96.6	102.1	113.4
16....	100.0	95.9	98.4	99.0	96.9	95.9	99.6	97.0	100.9	114.0
17....	100.3	95.9	98.6	98.5	96.1	96.7	100.9	97.3	100.5	114.7
18....	100.0	95.5	98.6	97.2	96.5	97.3	100.7	97.2	103.3	114.6
19....	100.3	95.1	99.0	97.2	95.6	98.6	100.9	96.9	104.1	114.7
20....	100.4	94.5	99.2	96.6	95.4	98.2	101.0	96.8	104.1	114.8
21....	100.3	94.6	99.0	96.5	94.8	98.4	100.9	96.9	104.9	115.2
22....	100.3	93.8	99.0	96.3	94.7	99.5	100.6	97.8	105.5	115.4
23....	100.2	93.7	98.7	95.1	95.1	99.3	100.3	98.8	105.7	115.8
24....	100.0	93.8	98.9	94.9	95.1	100.0	99.7	99.4	105.9	115.7
25....	100.2	93.7	98.9	94.3	94.6	100.6	100.6	99.8	106.2	115.8
26....	100.2	93.6	98.8	92.9	94.5	100.2	100.4	100.6	106.7	115.9
27....	99.9	94.3	98.3	93.5	94.1	100.5	99.7	100.5	106.5	115.7
28....	99.7	94.0	98.3	92.8	93.9	100.3	99.6	100.8	106.9	115.6
29....	99.7	93.9	98.3	91.9	94.6	100.3	97.3	101.2	107.0	115.5
30....	99.3	93.1	98.3	89.4	93.8	100.7	95.8	101.8	107.1	115.7
31....	98.9	93.0	98.4	89.0	93.5	101.1	94.5	102.3	108.0	115.6
32....	98.7	93.3	98.4	89.7	94.3	101.8	92.8	102.5	108.5	115.1
33....	98.5	94.1	98.5	89.1	95.1	102.2	93.6	102.3	108.9	115.3
34....	98.4	94.4	98.1	89.4	95.8	102.0	93.6	102.0	108.5	115.5
35....	98.2	94.9	98.0	91.3	95.9	103.4	93.7	103.1	108.1	113.9
36....	98.0	94.7	97.9	91.9	96.2	103.2	94.9	103.0	107.5	115.0
37....	97.9	95.2	97.4	91.8	96.0	102.7	95.5	102.8	107.3	114.7
38....	98.0	94.8	97.6	91.5	95.8	102.4	95.2	102.2	107.2	114.7
39....	98.0	94.1	98.2	91.2	95.8	102.8	95.4	101.6	107.2	113.8
40....	97.3	94.4	98.6	90.5	95.5	102.3	96.0	102.0	107.4	113.7
41....	96.8	95.1	99.0	90.5	95.8	102.3	95.7	101.6	107.6	113.5
42....	96.8	95.1	98.2	90.9	95.6	102.1	95.1	102.0	107.6	113.3
43....	97.1	95.4	98.0	92.7	95.8	101.8	95.5	101.9	107.8	113.5
44....	96.6	94.7	98.2	93.5	95.8	101.5	95.8	101.6	108.1	113.4
45....	95.6	94.7	98.1	94.5	96.8	100.4	98.2	101.8	108.4	113.3
46....	95.2	94.5	98.0	93.4	96.6	101.3	99.9	102.2	108.5	113.3
47....	95.9	94.8	98.0	94.4	97.1	100.9	99.8	102.3	108.8	113.6
48....	94.6	95.0	97.9	94.7	96.9	101.3	99.5	103.3	109.3	113.4
49....	93.4	96.1	97.7	94.1	97.2	101.3	99.7	104.2	109.9	113.4
50....	93.3	96.5	97.5	94.6	96.9	101.4	99.6	104.0	110.3	112.2
51....	93.5	97.1	97.3	93.0	96.9	99.7	99.3	104.0	110.3	110.2
52....	95.2	97.4	97.6	91.6	96.5	97.9	99.5	104.1	110.9	112.0
53....	94.9	....	....	....	....	....	99.3	.....	.....	.....

TABLE I—*Continued*

Week	Jan. 6 1900	Jan. 5 1901	Jan. 4 1902	Jan. 10 1903	Jan. 9 1904	Jan. 7 1905	Jan. 6 1906	Jan. 5 1907	Jan. 4 1908
1	112.2	117.9	118.8	116.9	114.3	117.3	116.9	112.9	105.6
2	112.2	117.8	118.7	117.3	114.2	117.5	117.0	112.9	106.4
3	112.9	117.5	118.6	117.2	114.9	117.9	117.1	113.0	107.2
4	113.9	118.0	119.3	116.3	114.7	117.7	116.8	113.0	107.8
5	114.3	118.0	119.6	116.9	114.5	117.8	116.7	112.8	109.1
6	114.8	118.7	119.5	117.0	114.1	118.0	116.5	112.6	108.1
7	114.6	118.8	119.5	116.9	114.2	118.1	116.4	112.2	107.9
8	114.1	118.3	119.5	116.7	113.6	118.0	116.4	112.1	107.3
9	114.1	118.8	119.5	116.1	113.6	118.1	115.7	111.8	106.1
10	114.3	118.7	119.7	115.9	113.6	117.9	115.7	111.0	106.4
11	114.2	118.7	119.7	115.8	113.5	117.7	115.4	110.2	106.2
12	114.5	118.9	120.1	115.8	113.6	118.1	115.3	109.8	105.9
13	114.9	118.9	120.1	115.2	113.7	117.9	115.4	109.0	106.0
14	115.0	118.8	120.0	114.5	114.0	117.9	115.1	108.9	106.5
15	115.3	118.6	120.0	114.6	114.0	117.8	114.9	109.9	106.8
16	115.1	118.4	120.3	115.2	114.2	117.6	114.8	109.9	107.1
17	115.0	118.5	120.1	115.2	114.4	117.5	114.3	110.5	107.4
18	115.0	118.5	120.1	115.6	114.4	117.5	114.2	110.5	107.6
19	114.4	117.9	120.2	115.9	114.7	117.7	114.1	110.4	107.6
20	114.2	117.9	119.9	115.4	114.3	117.7	114.4	109.9	107.8
21	114.3	118.0	119.7	115.2	114.3	117.6	114.6	109.8	107.9
22	114.0	118.0	119.8	115.3	114.2	117.4	114.5	109.5	107.5
23	114.2	118.2	119.8	114.7	114.4	117.4	114.5	109.2	107.8
24	113.8	119.0	119.8	114.7	114.7	117.3	114.6	109.0	107.4
25	113.5	119.0	119.7	114.3	114.9	117.3	114.6	108.7	107.4
26	113.4	118.8	119.8	114.0	115.1	117.1	114.5	108.9	107.4
27	113.2	118.6	119.6	113.7	115.4	117.1	114.5	108.5	108.1
28	113.8	118.0	119.5	113.3	115.4	117.1	114.4	108.9	107.4
29	114.0	117.8	119.6	113.1	115.9	117.2	114.4	108.7	107.6
30	113.9	117.6	119.5	112.9	115.8	117.3	114.2	108.7	108.2
31	113.8	117.6	119.4	112.5	116.0	117.4	114.0	108.7	108.4
32	113.8	117.5	119.2	112.7	115.9	117.3	113.9	108.5	109.0
33	114.0	117.7	119.0	112.3	115.8	117.6	113.8	107.8	108.7
34	113.9	117.5	118.8	112.2	115.8	117.7	113.7	107.8	108.9
35	113.9	117.9	118.8	112.8	115.9	117.2	113.6	107.4	108.8
36	114.0	117.7	118.7	113.0	116.1	117.2	113.4	107.2	109.4
37	114.7	117.7	118.5	113.3	116.2	117.2	113.1	107.1	109.5
38	113.7	117.7	118.3	112.8	116.1	117.3	112.7	107.1	109.4
39	113.5	117.6	117.2	112.3	116.0	117.2	112.7	107.4	109.4
40	113.4	117.3	118.5	112.0	116.0	117.2	113.0	107.1	109.3
41	113.6	117.6	118.1	112.9	116.2	117.3	113.2	107.0	109.5
42	113.6	117.9	117.9	113.8	116.2	117.3	113.3	106.6	109.7
43	114.2	118.0	118.0	114.1	116.3	117.2	113.2	105.7	109.9
44	114.1	118.0	118.1	113.8	116.5	117.4	113.1	105.2	110.5
45	114.6	118.2	117.8	113.3	116.5	117.2	113.0	104.8	110.7
46	115.6	118.2	117.7	113.7	116.7	117.0	112.8	104.1	110.9
47	115.3	118.5	117.6	113.6	116.4	116.8	113.2	102.4	111.1
48	116.1	118.5	117.7	113.8	116.8	116.9	113.6	102.7	111.2
49	116.6	118.1	117.3	114.0	116.9	116.7	113.4	104.1	111.6
50	116.8	117.9	117.3	114.0	116.9	116.9	113.0	104.3	111.9
51	117.1	117.9	116.8	114.1	117.1	116.7	112.8	103.8	111.6
52	117.5	118.3	116.8	114.1	117.3	116.7	112.3	104.1	111.8
53	.....	.....	116.8	.....	.....	.....	.....	.....	112.1

tenders in the New York Clearing House banks for the same period. These figures were taken from the publications of the National Monetary Commission.[1] In a few years in which there should have been given 53 weekly statements of the Clearing House, one weekly statement was omitted and had to be supplied from the files of the *Commercial and Financial Chronicle*. As is well known,

[1] *Statistics for the United States*, 1867–1909, pp. 98–118. Compiled by A. Piatt Andrew (Washington, 1910).

these statements give for each week the average amount held for that week in the combined statement for all of the banks that belong to the Clearing House. It is recognized that the figures

TABLE II

INDEX NUMBERS OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, MONTHLY, 1890–1908

(Average 1890–1899 = 100)

Month	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899
January	99.6	96.0	97.8	98.7	92.8	96.2	98.8	100.3	105.2	112.5
February	99.4	96.1	98.5	99.6	93.2	94.8	100.6	100.3	106.1	113.1
March	99.6	95.4	98.1	98.8	94.7	94.8	99.7	98.7	103.1	113.2
April	99.8	95.5	98.5	98.9	96.9	95.9	100.0	96.9	101.5	113.9
May	100.3	94.9	99.0	96.8	95.4	98.4	100.9	97.0	104.1	114.9
June	100.2	93.8	98.9	94.3	94.8	100.0	100.3	99.3	106.0	115.8
July	99.5	93.8	98.3	91.9	94.1	100.6	97.4	101.1	106.9	115.6
August	98.5	93.7	98.3	89.5	94.9	102.4	93.4	102.3	108.4	115.1
September	98.0	94.7	97.8	91.6	96.0	102.8	95.5	102.5	107.3	114.6
October	96.9	95.0	98.5	91.2	95.7	102.0	95.5	101.9	107.6	113.5
November	95.3	94.7	98.0	94.1	96.9	101.0	99.4	102.0	108.5	113.4
December	94.1	96.4	97.5	93.3	96.9	100.1	99.5	103.9	110.1	112.0

Month	1900	1901	1902	1903	1904	1905	1906	1907	1908
January	113.1	117.8	119.0	116.9	114.5	117.6	116.9	112.9	107.2
February	114.4	118.7	119.5	116.9	114.1	118.0	116.3	112.2	107.4
March	114.5	118.8	119.9	115.9	113.6	117.9	115.5	110.0	106.1
April	115.1	118.6	120.1	114.9	114.2	117.7	114.8	109.8	107.1
May	114.4	118.1	119.9	115.5	114.4	117.6	114.4	110.0	107.7
June	113.7	118.8	119.8	114.8	114.7	117.3	114.6	109.0	107.5
July	113.7	117.9	119.5	113.4	115.6	117.2	114.4	108.7	107.9
August	113.9	117.7	119.0	112.4	115.9	117.4	113.8	107.9	108.9
September	114.0	117.7	118.2	112.8	116.1	117.2	113.0	107.2	109.4
October	113.8	117.8	118.1	113.2	116.2	117.3	113.2	106.3	109.9
November	115.4	118.4	117.7	113.6	116.6	117.1	113.2	103.5	111.0
December	117.0	118.1	117.0	114.0	117.1	116.8	112.9	104.1	111.8

TABLE III

INDEX NUMBERS OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, YEARLY, 1890–1908

(Average 1890–1899 = 100)

1890	98.4	1895	99.1	1900	114.4	1905	117.4
1891	95.0	1896	98.4	1901	118.2	1906	114.4
1892	98.3	1897	100.6	1902	118.9	1907	108.5
1893	94.9	1898	106.3	1903	114.5	1908	108.5
1894	95.1	1899	114.0	1904	115.2		

are not strictly comparable throughout the period, for the number of banks varies from 66 to 48; the larger number applies to the earlier years. The decline in the number of banks is no doubt due,

generally, to consolidation, and so in most cases is merely nominal. But even granting that some of the changes in numbers represent real changes in the banking area covered by the statistics, yet the reports give us, of all available statistics, by far the most reliable figures for changes in the amount of money in any financial center of the United States.

The results obtained by comparing the movement of bond prices with that of specie and legal tenders for various weeks are given in Table IV.

TABLE IV

CORRESPONDENCE OF THE MOVEMENT OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, WEEKLY, 1890–1908, WITH THE MOVEMENT OF THE AMOUNT OF SPECIE AND LEGAL TENDERS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF SPECIE AND LEGAL TENDERS FOR	CORRESPONDENCE			
	+	−	o	Degree
Third week previous	466	389	134	+.078
Second week previous	481	373	136	+.109
Previous week	527	330	134	+.199
Same week	495	362	134	+.134
Following week	487	372	132	+.116
Second week following	452	405	134	+.047

The highest degree of correspondence is revealed when we compare the movement of the bond prices with the movement of specie and legal tenders for the previous week. The result may be put in another way, namely, that during the period considered, in 60 out of 100 cases, a movement in the amount of specie and legal tenders was followed the next week by a movement of bond prices in the same direction.

So much has been written of bank deposits as currency, that it will be of interest to see whether any relation exists between their movement and the movement of bond prices. As in the previous case, the figures for the net deposits of the New York Clearing House banks are taken from the publications of the National Monetary Commission,[1] with omissions supplied from the *Commercial and Financial Chronicle*. Comparing the two movements at varying intervals we obtain the results found in Table V.

[1] *Statistics for the United States*, 1867–1909, pp. 98–118.

Here the greatest correspondence is for the same week; for the period covered, in about 61 cases out of 100 the two movements correspond. Slightly more correspondence is seen in the weeks following than for the weeks preceding, showing that there are more cases in which a change in the bond price movement was followed by a corresponding change in net deposits than there are cases in which a change in net deposits is followed by a corresponding change in bond prices.

TABLE V

CORRESPONDENCE OF THE MOVEMENT OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, WEEKLY, 1890–1908, WITH THE MOVEMENT OF NET DEPOSITS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF NET DEPOSITS FOR	CORRESPONDENCE			
	+	−	o	Degree
Second week previous	460	401	129	+.060
Previous week	516	340	135	+.178
Same week	533	323	135	+.212
Following week	531	327	133	+.206
Second week following	491	367	133	+.125

From the weekly figures for specie and legal tenders and for net deposits the monthly figures were derived by taking the average of the amounts for the four or five weeks which lie wholly or for most part within the month. The comparison of the movement

TABLE VI

CORRESPONDENCE OF THE MOVEMENT OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, MONTHLY, 1890–1908, WITH THE MOVEMENT OF SPECIE AND LEGAL TENDERS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF SPECIE AND LEGAL TENDERS FOR	CORRESPONDENCE			
	+	−	o	Degree
Previous month	120	94	12	+.115
Same month	131	84	12	+.207
Following month	108	107	12	+.004

of these figures for specie and legal tenders with the movement of the monthly index number of bond prices, gives Table VI. In this case there appears to be a fair amount of correspondence for

the same month and considerably more for the previous month than for the following month.

The monthly movement of net deposits shows the correspondence with the movement of bond prices at varying intervals noted in Table VII. We find for this comparison the same general results as in the comparison of the weekly movements of these same two sets of figures, but here the correspondence is higher.

TABLE VII

CORRESPONDENCE OF THE MOVEMENTS OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, MONTHLY, 1890–1908, WITH THE MOVEMENT OF NET DEPOSITS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF NET DEPOSITS FOR	CORRESPONDENCE			
	+	−	o	Degree
Previous month	121	93	12	+.124
Same month	148	67	12	+.357
Following month	127	88	12	+.172

The month is the shortest interval at which we have estimates made of the amount of money in circulation in the United States. The publications of the National Monetary Commission[1] give estimates of the amount of money in circulation on the first day of each month. A figure for the circulation for the month was found by taking the average of the estimates for the first of the month and for the first of the following month, e.g., the amount of money in circulation in January was taken as the average of the amounts in circulation on January 1 and February 1. The New York bond market is in a sense a national market, so we may compare the movement of bond prices with the amount of money in circulation as calculated by the above method (see Table VIII).

The highest degree of correspondence is that with the money in circulation for the previous month. For this period in 58 out of 100 cases a change in the amount of money in circulation was followed by a similar movement in bond prices the next month. Less correspondence is shown here than was obtained when the comparison was with specie and legal tenders or with net deposits in the New York Clearing House banks.

[1] *Statistics for the United States*, 1867–1909, pp. 161–64.

Yearly averages are given in the publications of the National Monetary Commission[1] for the amounts of specie and legal tenders and net deposits in the New York Clearing House banks. These

TABLE VIII

CORRESPONDENCE OF THE MOVEMENT OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, MONTHLY, 1890–1908, WITH THE MOVEMENT OF THE AMOUNT OF MONEY IN CIRCULATION IN THE UNITED STATES

MOVEMENT OF TOTAL CIRCULATION FOR	CORRESPONDENCE			
	+	−	o	Degree
Second month previous	117	92	16	+.111
Previous month	123	87	16	+.159
Same month	115	96	16	+.084
Following month	98	113	16	−.066

TABLE IX

CORRESPONDENCE OF THE MOVEMENT OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, YEARLY, 1890–1908, WITH THE MOVEMENT OF THE AMOUNT OF SPECIE AND LEGAL TENDERS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF SPECIE AND LEGAL TENDERS FOR	CORRESPONDENCE			
	+	−	o	Degree
Previous year	12	5	1	+.389
Same year	13	4	1	+.500
Following year	4	13	1	−.500
Second year following	12	5	1	+.389

TABLE X

CORRESPONDENCE OF THE MOVEMENT OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, YEARLY, 1890–1908, WITH THE MOVEMENT OF NET DEPOSITS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF NET DEPOSITS FOR	CORRESPONDENCE			
	+	−	o	Degree
Previous year	11	6	1	+.278
Same year	14	3	1	+.611
Following year	6	11	1	−.278

averages are compared with the yearly bond prices in Tables IX and X. The table shows a high degree of positive correspondence for the same year and an equally high degree of negative

[1] *Statistics for the United States*, 1867–1909, pp. 98–118.

correspondence for the following year. In other words, in the proportion of 75 out of 100 cases the two moved together, and in the proportion of 75 out of 100 cases a movement of bond prices in one direction was followed the next year by a movement of specie and legal tenders in the opposite direction. Of course, where the number of cases considered is so small there may be a large element of chance in the results. The correspondence for the same year is high. In the proportion of 81 out of 100 cases, the movement is in the same direction.

With the yearly movement of bond prices we compare both the movement of the total circulation of money and the movement of the per capita circulation of money. For the latter figures we take the estimates for July 1, as given in the publications of the National Monetary Commission.[1] July 1 is the mid-point of the year, and so may be taken as the figure for the year. One change has been made in the figures as given by the National Monetary Commission. The figures given are the estimates of the Director of the Mint. As is known these are prepared by starting with the estimate of the previous year and adding an amount which represents new coins and bills and importations, and subtracting an amount which represents coins melted and exported and bills retired, and adding or subtracting the net movement out from or into the Treasury. As the result of a special investigation, the Director of the Mint subtracted $135,000,000 from the estimate for July 1, 1907, to cover mistakes which had been made previously. This subtraction makes no difference in our calculation of the movement of total circulation, for after subtracting this amount there is an increase over the previous year. However it does make a difference in the per capita circulation. In order to get figures strictly comparable, therefore, an amount for per capita circulation was calculated for 1907 to be used in comparison with 1906 by adding $135,000,000 to the total circulation on July 1, 1907, and dividing by the figure for the estimated population of the United States on that date which was used by the Director of the Mint.[2] For the comparison of 1907 with 1908 the revised figure was used.

[1] *Statistics for the United States*, 1867–1909, p. 155.

[2] *Statistical Abstract for the United States* for 1911, p. 580

For the period covered by the index numbers of bond prices, the movement of total circulation and per capita circulation is exactly the same, so that one correspondence table will suffice for both (Table XI).

TABLE XI

CORRESPONDENCE OF THE MOVEMENT OF BOND PRICES ON THE NEW YORK STOCK EXCHANGE, YEARLY, 1890–1908, WITH THE MOVEMENT OF TOTAL CIRCULATION AND ALSO PER CAPITA CIRCULATION OF MONEY IN THE UNITED STATES

MOVEMENT OF TOTAL AND PER CAPITA CIRCULATION FOR	CORRESPONDENCE			
	+	−	o	Degree
Previous year	11	6	1	+.278
Same year	13	4	1	+.500
Following year	9	8	1	+.056

It is scarcely necessary to point out the small number of cases considered and the consequent element of chance which enters into the calculation. With this reservation we may say that there is a high degree of correspondence shown for the same year.

To sum up: The degree of correspondence has been computed between the movements of the index numbers of bond prices on the New York Stock Exchange from 1890 to 1908 and the movement of specie and legal tenders and of net deposits in the New York Clearing House banks and the movement of the total and per capita circulation of money in the United States. Three computations are made in the comparison with the movement of specie and legal tenders and with the movement of net deposits using weekly, monthly, and yearly averages. For the comparison with the total circulation of money both monthly and yearly averages are used. Only yearly averages are employed in the comparison with the per capita circulation of money.

In all, nine computations of the Degree of Correspondence are made. Of these nine, the highest are those which arise from the comparison of the yearly movements of the index numbers of bond prices with the various movements of money in banks and in circulation and the movement of net deposits in banks. The maximum Degree of Correspondence shown is that of the movement of the

yearly index number of bond prices with the yearly changes in the amount of net deposits in the New York Clearing House banks. This maximum correspondence indicates that in the proportion of 81 out of 100 cases, the two movements agreed in the direction of their changes. Even this maximum observed correspondence is far from being complete. Still, sufficient correspondence is shown to favor J. F. Johnson's view that bond prices adjust themselves fairly readily to price changes, rather than Irving Fisher's view that bond prices are in the class of prices which are the last to be affected in price changes. In six of the cases considered, the correspondence of the movement of the index numbers of bond prices is greatest when the comparison is made with the movement of specie and legal tenders, net deposits, total circulation of money, or per capita circulation of money for the *same* week, month, or year, as the case may be. In these cases, therefore, no element of lag is shown.

In the comparison of the weekly and monthly bond price movement with the movement of net deposits, the correspondence with the movement of net deposits for the following week or month is higher than with the movement for the preceding week or month. The conclusion is that changes in the amount of net deposits have more frequently adjusted themselves to bond prices than bond prices have adjusted themselves to the amount of net deposits. When we test the relationship between bond price movement and the movement of specie and legal tenders, total and per capita circulation of money, and the yearly averages of net deposits, we find that the correspondence is greater when the comparison is between the bond price movement and the movement of the other terms of the comparison for a preceding week, month, or year than when it is for a following week, month, or year. From this circumstance we conclude that there is more causal influence from the specie and legal tenders, total and per capita circulation of money, and the yearly average of net deposits to the bond prices than there is in the reverse direction.

We infer from the degree of correspondence shown that considerable allowance must be made for "other things" not "being equal," especially in the weekly and monthly comparisons.

III. MONEY AND STOCK PRICES

Professor Mitchell has compiled an index number of stock prices on the New York Stock Exchange, monthly and yearly, from 1890 to 1909.[1] The average price of the stocks from 1890 to 1899 is taken as the base. The prices of forty stocks are included, thirty-five are the common stocks of railroads and the other five are the stocks of express, steamship, and telegraph companies. An index number for the high and the low price for each month is given. For the purpose of testing the correspondence with the movement of the volume of money, the mean of these high and low quotations was taken as the index number for the month. We compare first the monthly stock price movement and the figures for the monthly averages of specie and legal tenders in the New York Clearing House banks derived as was explained above.

TABLE XII

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (MITCHELL'S INDEX NUMBERS), MONTHLY, 1890–1909, WITH THE MOVEMENT OF THE AMOUNT OF SPECIE AND LEGAL TENDERS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF SPECIE AND LEGAL TENDERS FOR	CORRESPONDENCE			
	+	−	o	Degree
Second month previous	120	108	9	+.051
Previous month	119	110	9	+.038
Same month	119	111	9	+.033
Following month	130	99	9	+.130
Second month following	104	124	9	−.084

In general it is seen that little correspondence is shown. The greatest correspondence is in the case which indicates that a movement in stock prices was, in about 57 times out of 100, followed the next month by a corresponding movement in the amount of specie and legal tenders in the banks.

We next take the comparison of the monthly stock prices with the movement of net deposits in the New York Clearing House banks as shown by the figures derived as was explained above.

[1] "The Prices of American Stocks, 1890–1909," *The Journal of Political Economy*, XVIII (May, 1910), 345–80.

TABLE XIII

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (MITCHELL'S INDEX NUMBERS), MONTHLY, 1890–1909, WITH THE MOVEMENT OF NET DEPOSITS OF THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF NET DEPOSITS FOR	CORRESPONDENCE			
	+	−	o	Degree
Previous month	127	102	9	+.105
Same month	132	98	9	+.142
Following month	136	93	9	+.181
Second month following	127	101	9	+.110

The correspondence exhibited here is considerably higher than that shown in the preceding case and here again the greatest correspondence is shown with the month following. In 59 out of 100 cases the movement in stock prices is followed by a corresponding movement in net deposits.

As in the case of bond prices, we may compare the movement of stock prices with the movement of the total money in circulation in the United States, since the whole country buys in the New York market.

TABLE XIV

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (MITCHELL'S INDEX NUMBERS), MONTHLY, 1890–1909, WITH THE MOVEMENT OF THE TOTAL CIRCULATION OF MONEY IN THE UNITED STATES

MOVEMENT OF TOTAL CIRCULATION FOR	CORRESPONDENCE			
	+	−	o	Degree
Previous month	118	107	13	+.046
Same month	121	105	13	+.067
Following month	122	104	13	+.075
Second month following	114	112	13	+.008

Very little correspondence is shown. As was true of the two preceding cases, the greatest amount of correspondence comes in the comparison with the following month.

We compare next the yearly movement of stock prices with the movement of the yearly averages of the amounts of specie and

legal tenders and of net deposits in the New York Clearing House banks.

TABLE XV

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (MITCHELL'S INDEX NUMBERS), YEARLY, 1890–1909, WITH THE MOVEMENT OF THE AMOUNT OF SPECIE AND LEGAL TENDERS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF SPECIE AND LEGAL TENDERS FOR	CORRESPONDENCE			
	+	−	o	Degree
Second year previous	9	9	o	o
Previous year	14	5	o	+.474
Same year	11	8	o	+.158
Following year	8	10	o	−.111

The correspondence with the previous year is highest. In the proportion of 74 out of 100 cases, a movement in specie and legal tenders in one year was followed by a corresponding movement in stock prices the next year.

TABLE XVI

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (MITCHELL'S INDEX NUMBERS), YEARLY, 1890–1909, WITH THE MOVEMENT OF NET DEPOSITS IN THE NEW YORK CLEARING HOUSE BANKS

MOVEMENT OF NET DEPOSITS FOR	CORRESPONDENCE			
	+	−	o	Degree
Second year previous	8	10	o	−.111
Previous year	16	3	o	+.684
Same year	11	8	o	+.158
Following year	6	12	o	−.333

The correspondence of the movement of stock prices with the movement of net deposits for the previous year is high. In the proportion of 84 cases out of 100 a movement of net deposits was followed by a corresponding movement in stock prices the next year. However, there are scarcely enough cases to make it safe to generalize.

Mitchell's yearly index numbers of stock prices give the following tables when compared with the total circulation and also the

per capita circulation of the United States obtained as indicated above.

TABLE XVII

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (MITCHELL'S INDEX NUMBERS), YEARLY, 1890–1909, WITH THE TOTAL CIRCULATION OF MONEY IN THE UNITED STATES

MOVEMENT OF TOTAL CIRCULATION FOR	CORRESPONDENCE			
	+	−	o	Degree
Second year previous	8	11	0	−.158
Previous year	12	7	0	+.263
Same year	12	7	0	+.263
Following year	10	9	0	+.053

A fair degree of correspondence is indicated for the previous year and for the same year. The correspondence is the same for both cases.

TABLE XVIII

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (MITCHELL'S INDEX NUMBERS), YEARLY, 1890–1909, AND THE MOVEMENT OF PER CAPITA CIRCULATION OF MONEY IN THE UNITED STATES

MOVEMENT OF PER CAPITA CIRCULATION FOR	CORRESPONDENCE			
	+	−	o	Degree
Second year previous	9	10	0	−.053
Previous year	12	7	0	+.263
Same year	12	7	0	+.263
Following year	9	10	0	−.053

The greatest correspondence is the same here as in Table XVII, the previous year and the same year having a fair degree of correspondence.

Commons and Stone prepared for the Industrial Commission, a yearly index number of the prices of 28 railroad stocks for the years ending June 30, 1879–1901.[1] Since the fiscal year is used instead of the calendar year, we must compare the movement with the total and per capita circulation of money for January 1

[1] *Report of the United States Industrial Commission*, XIX, 29.

instead of July 1, as in the former cases. The figures for January 1, 1879, were obtained from the *Monthly Summary of Commerce and Finance*.[1] The total circulation for the other years was taken from the publications of the National Monetary Commission.[2] The figures for the per capita circulation were obtained by taking the arithmetic means of the amounts for the June 30 preceding and the June 30 following. The comparisons of these figures with the stock price movement is given in Table XIX.

TABLE XIX

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (COMMONS AND STONE'S INDEX NUMBERS), YEARLY, 1879–1901, WITH THE MOVEMENT OF THE TOTAL MONEY IN CIRCULATION IN THE UNITED STATES

MOVEMENT OF TOTAL CIRCULATION FOR	CORRESPONDENCE			
	+	−	0	Degree
Third year previous	8	11	0	−.158
Second year previous	15	5	0	+.500
Previous year	12	9	0	+.143
Same year	13	9	0	+.182
Following year	17	5	0	+.545
Second year following	14	7	0	+.333

The figures do not exhibit the regularity of results observable in the other tables. Perhaps this fact is due to the small number of years available and to some sort of periodicity. A high degree of correspondence is shown for the following year and also about the same amount for the second year previous. Our next comparison is with the per capita circulation of money in the United States (Table XX). Once again the results are not regular. The highest degree of correspondence is shown this time by the second year following.

To sum up: With the movement of Mitchell's monthly index numbers of stock prices has been compared the movement of specie and legal tenders and of net deposits in the New York Clearing House banks and of the total of circulation of money in the United States. Further, comparison has also been made between the

[1] *Monthly Summary of Commerce and Finance* for June, 1912, p. 2018.

[2] *Statistics for the United States*, 1867–1909, pp. 159–63.

yearly movement of the index numbers of the stock prices and the per capita circulation of money in the United States. The movement of Commons and Stone's index numbers has been compared with the yearly movement of total and of per capita circulation of money in the United States.

TABLE XX

CORRESPONDENCE OF THE MOVEMENT OF STOCK PRICES ON THE NEW YORK STOCK EXCHANGE (COMMONS AND STONE'S INDEX NUMBERS), YEARLY, 1879–1901, WITH THE MOVEMENT OF PER CAPITA CIRCULATION OF MONEY IN THE UNITED STATES

MOVEMENT OF PER CAPITA CIRCULATION FOR	CORRESPONDENCE			
	+	−	o	Degree
Second year previous	9	11	0	−.100
Previous year	14	7	0	+.333
Same year	13	9	0	+.182
Following year	13	9	0	+.182
Second year following	16	5	0	+.524
Third year following	13	7	0	+.300

As in the case of bond prices, the correspondence between the stock price movement and the various other movements with which it is compared is greater for the movement of the yearly averages than for the movements of the averages for the shorter periods. The movement of stock prices corresponds more closely with the movement of net deposits than with the movement of specie and legal tenders. The maximum correspondence is found in the comparison of the yearly movement of stock prices and the yearly movement of net deposits. The two movements correspond in direction in the proportion of 84 cases out of 100. This correspondence is slightly higher than the maximum in the case of the comparisons made with the bond price movement, but still is not complete correspondence. The correspondence obtained in the comparisons involving the monthly movement of stock prices is not so high as that obtained in the similar comparisons of the monthly movement of bond prices. We may contrast the relative amounts of correspondence obtained when the movement of Mitchell's index number of stock prices is compared with the movement of specie and legal tenders, of net deposits, and of total and per capita circulation of

money for preceding months or years and for following months or years. The contrast bears out Irving Fisher's analysis, at least so far as the direction of the change is concerned; since he holds that for short periods, the amounts of money and deposits to some extent adapt themselves to the needs of trade, but that normally the price level is passive and is controlled by the other terms of the equation of exchange. The confirmatory evidence is that the monthly observations show more causal influence from the stock prices to the specie and legal tenders, net deposits, and total circulation than in the reverse direction, while for the yearly averages, more causal influence is shown from the specie and legal tenders, net deposits, and total and per capita circulation of money to the stock prices than in the reverse direction. However, when we use the Commons and Stone index numbers, which are also yearly averages, the comparison shows more causal influence from the stock prices to the total and per capita circulation than in the reverse direction. Just why there should be this difference between the two index numbers is not evident. Perhaps it is due to the fact that the time covered by the index numbers is not the same. The Mitchell index numbers cover the period from 1890 to 1909, while the Commons and Stone figures are for the period from 1879 to 1901.

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